Patent Office

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): H02K [01/14, 01/20, 05/06, 05/08, 05/15, 05/18, 05/20, 05/24, 19/06, 19/10, 37/04, 37/16]

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	NONE	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

PATENT SPECIFICATION (11) 1 401 243

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(54) IMPROVEMENTS IN ALTERNATING CURRENT GENERATORS

(71) We, ROBERT BOSCH GMBH, a German Company, of Postfach 50, 7 Stuttgart 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to alternating current generators of claw-pole rotor construction, such as three-phase generators for vehicles.

The present invention provides an alternating current generator of claw-pole rotor construction and having a housing which comprises a shell and two substantially planar bearing plates attached to the ends of the shell, a stator surrounding the poles of the claw-pole rotor being substantially wholly received in the shell and the shell being cast integrally with a pivot arm for supporting the generator and which is attached to the shell along substantially the entire axial length of the shell, and with a retaining arm, which arms enable the generator to be mounted in a desired position.

Thus, the generator can be fastened in a satisfactory and reliable manner which particularly minimizes risk of fracture of the pivot arm.

In one embodiment the bearing plates are both fastened to the shell to form the housing.

In another embodiment one bearing plate is cast integrally with the shell to form a cup-shaped bearing member.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a longitudinal section through a generator;

Fig. 2 is an end view of the generator with belt pulley and fan removed, seen in the direction of the arrow II in Fig. 1;

Fig. 3 is a longitudinal section through another generator; and

Fig. 4 is a view of the generator, with the belt pulley and fan removed, in the direction of the arrow IV in Fig. 3.

A three-phase vehicle generator 10 is shown in a longitudinal section in Fig. 1. The generator includes a claw-pole rotor 11 having an excitation winding 12 and a current supply device provided with slip rings 13 and brushes 14. The rotor is arranged on a shaft 15 which is journalled in a bearing 16 in a bearing plate 17 at the driven end and in a bearing 18 in a bearing plate 19 at the slip-ring end of the generator housing. The central zone of the housing is formed by a shell 20. A drive pulley 21 and a fan 22 are also mounted on the generator shaft 15. The claw-pole rotor 11 comprises poles which extend alternately in a claw-like manner from pole discs arranged at opposite ends of the excitation winding 12 whose field is directed axially of the generator.

The shell and the two bearing plates are castings. A pivot arm 25 and a retaining arm 26 are cast externally on the shell which overlies the rotor claw-poles and the inside of which carries a stator 23 provided with a three-phase stator winding 24. The stator is fixed in the shell 20 by a shrink fit of the shell about the stator, i.e. by heating the shell before the stator is inserted. The stator is further secured in the shell by pins (not shown). The retaining arm 26 and the pivot arm 25 are cast integrally with the shell 20. The pivot arm 25, carrying the main weight of the generator, is attached to the shell 20 along the entire axial length thereof. The main purpose of this is to avoid bending stresses in the casting. The pivot arm 25 is preferably attached to the shell below the centre of gravity of the generator.

The retaining arm 26 is subjected to less dynamic stress than the pivot arm 25 during operation of the generator, since, in addition to the mass acceleration forces, the pivot arm must also withstand the greater part of the forces occasioned by the drive. Thus, in order to relieve the stress on the pivot arm, it may be advantageous for the retaining arm to act upon the generator housing somewhat nearer to the driven end (as in the generator of Figs. 1 and 2), since,

with less bending stress, the retaining arm can withstand a larger proportion of the drive forces acting upon the belt pulley 21.

A bearing bush 29 passes through resilient rubber damping bushes 28 which are inserted into a bore 27 in the pivot arm 25. The fastening means of the generator are inserted through the bearing bush 29. The generator can be swung about the axis of the bearing bush 29 to tighten the fan belt.

The retaining arm 26 is narrower than the pivot arm 25. As in the case of the pivot arm, damping bushes 31 of resilient material, such as rubber, and a bearing bush 32 for the passage of fastening means are inserted into a bore 36 in the retaining arm 26. The bearing bushes 29 and 32 may be made from plastics material or metal.

Fig. 2 is an end view showing the arrangement of the pivot arm 25 and the retaining arm 26, and the manner in which they are integrally connected to the shell 20.

In Fig. 3, a three phase vehicle generator 10^1 is shown in longitudinal section. This contains a claw-pole rotor 11 with a field winding 12 and a current supply device comprising slip rings 13 and brushes 14. The rotor is arranged on a shaft 15, which is mounted in a bearing 16 in a bearing plate 17^1 at the driven end and in a bearing 18 in a bearing plate 19^1 at the slip ring end of the generator housing. The bearing plate 19^1 at the slip ring end is cup-shaped and overlies the claw-poles of the rotor. The bearing plate 17^1 arranged at the driven end is substantially flat and closes the cup-shaped bearing plate 19^1. The part of the cup-shaped bearing plate 19^1 overlying the poles forms a shell and is denoted by 20^1. Further, a driving pulley 21 and a fan 22 are fixed on the generator shaft 15. The claw-pole rotor 11 comprises poles which extend alternately in a claw-like manner from pole discs arranged at opposite ends of the field winding 12 whose field is directed axially of the generator.

The bearing plate 17^1 at the driven end and the cup-shaped bearing plate 19^1 at the slip ring end are in each case formed as a cast metal part. The stator 23 of the generator with its three-phase winding 24 is clamped between a flanged-shaped shoulder at the slip ring end and the bearing plate 17^1 at the driven end so that the shell 20 overlies the stator, the bearing plates 17^1 and 19^1 being attached to one another by longitudinally extending screws to form the generator housing. A pivot arm 25 and a retaining arm 26 extend outwardly from the housing shell 20^1 of the cup-shaped bearing plate. The retaining arm and the pivot arm are also cast-metal parts, which are integral with the cup-shaped bearing plate 19^1. The pivot arm carrying the main weight of the generator is attached to the shell 20^1 of the cup-shaped bearing plate 19^1 along the whole axial length of the latter. This feature substantially eliminates bending stresses in the cast-metal part. The pivot arm is preferably attached to the shell 20^1 of the cup-shaped bearing plate 19^1 below the centre of gravity of the generator. It is important for the generator to be supported in the region of its centre of gravity in order that no lever arm should be available to the forces of gravity which occur. Bending stresses are thus largely excluded.

During the operation of the generator of Figs. 3 and 4 the retaining arm is dynamically less stressed than the pivot arm, since in addition to the gravity acceleration forces, the pivot arm must also take up the greater part of the forces originating from the drive. For the relief of the load on the pivot arm, it may therefore be advantageous, as for example, in the case of the generator shown, to arrange for the retaining arm to engage the generator housing somewhat closer to the driven end, since with a small bending stress, it is thus able to take up a greater part of the driving forces acting on the belt pulley 21.

Rubber damping bushes 28, by which a bearing bush 29 is gripped, are inserted in a bore 27 in the pivot arm 25. The fastening means for the generator are introduced into this bush 29. The swing of the generator necessary to adjust the fan belt tension takes place around the axis of the bush 29.

The retaining arm 26 is made narrower than the pivot arm 25. As with the pivot arm, rubber damping bushes 31 and a bearing bush 32 are inserted in its bore 30 for the passage of fastening means. The bushes 29 and 32 may consist of plastics or metal.

Fig. 4 is an end view and shows the arrangement of the pivot arm 25 and the retaining arm 26, and their connection with the shell 20^1 of the cup-shaped bearing plate 19^1. As may be seen from Fig. 4, two retaining arms 26 can be provided instead of one. Owing to this the assembly possibilities of the generator become extensive, since the retaining arm at either side or at both sides may be used.

Fractures known to have occurred in prior art generators, especially of the pivot arm, are substantially avoided by the illustrated constructions. The generators described are untroubled by very high stresses from the drive and through gravity forces, which is important above all with vehicle generators. Vehicle generators are subject to particularly high shaking stresses, since modern vehicle generators are driven at a range of speed from say 0 to 12,000 revolutions per minute. The improvement in the fastening means described represents an important ad-

vance in the total length of life attainable of the said generators.

WHAT WE CLAIM IS:—

1. An alternating current generator of claw-pole rotor construction and having a housing which comprises a shell and two substantially planar bearing plates attached to the ends of the shell, a stator surrounding the poles of the claw-pole rotor being substantially wholly received in the shell and the shell being cast integrally with a pivot arm for supporting the generator and which is attached to the shell along substantially the entire axial length of the shell, and with a retaining arm, which arms enable the generator to be mounted in a desired position.

2. An alternating current generator as claimed in claim 1 in which damping bushes made from resilient material are inserted into bores provided in the retaining arm and in the pivot arm.

3. An alternating current generator as claimed in claim 2, in which the resilient damping bushes contain bearing bushes made from metal or plastics material.

4. An alternating current generator as claimed in any preceding claim which is a three-phase generator.

5. An alternating current generator as claimed in any of claims 1 to 4 in which both of the bearing plates are fastened to the shell by fiixing screws.

6. An alternating current generator as claimed in any of claims 1 to 4 in which one bearing plate is cast integrally with the shell to form a cup-shaped bearing member which is closed by the other bearing plate.

7. An alternating current generator as claimed in claim 6 in which said other substantially flat bearing plate is arranged at the driven end of the generator.

8. An alternating current generator constructed substantially as hereinbefore described with reference to and as illustrated in Figs. 1 and 2 of the accompanying drawings.

9. An alternating current generator constructed substantially as herein described with reference to and as illustrated in Figs. 3 and 4 of the accompanying drawings.

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Fig.1

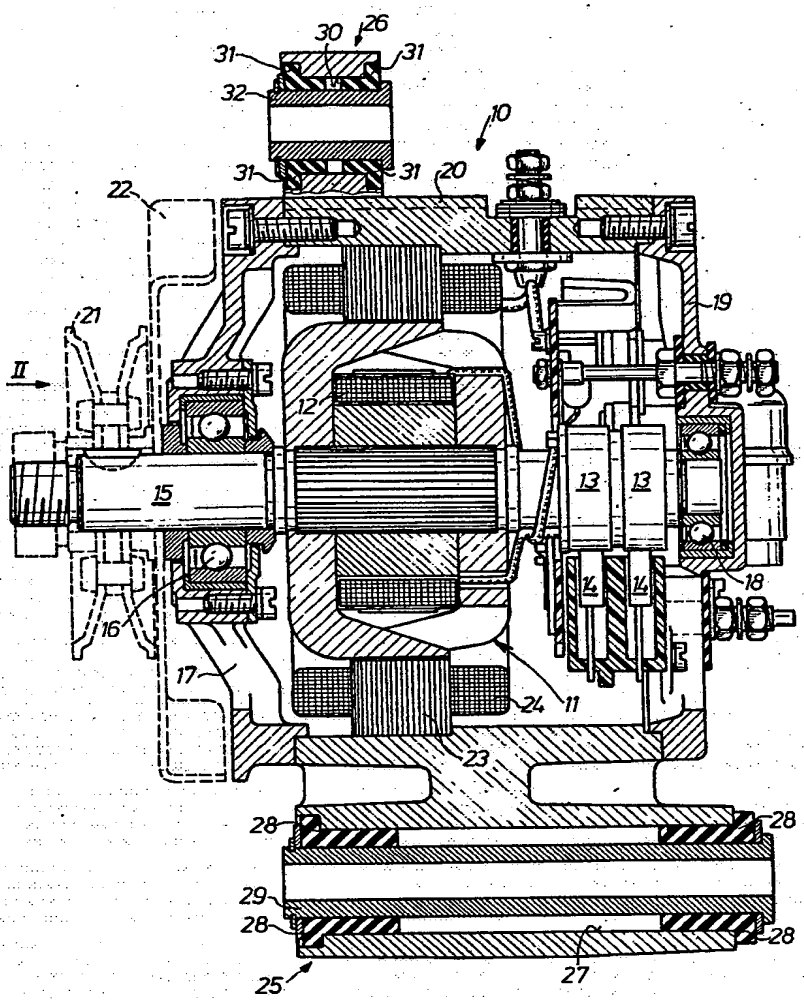

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Fig. 2

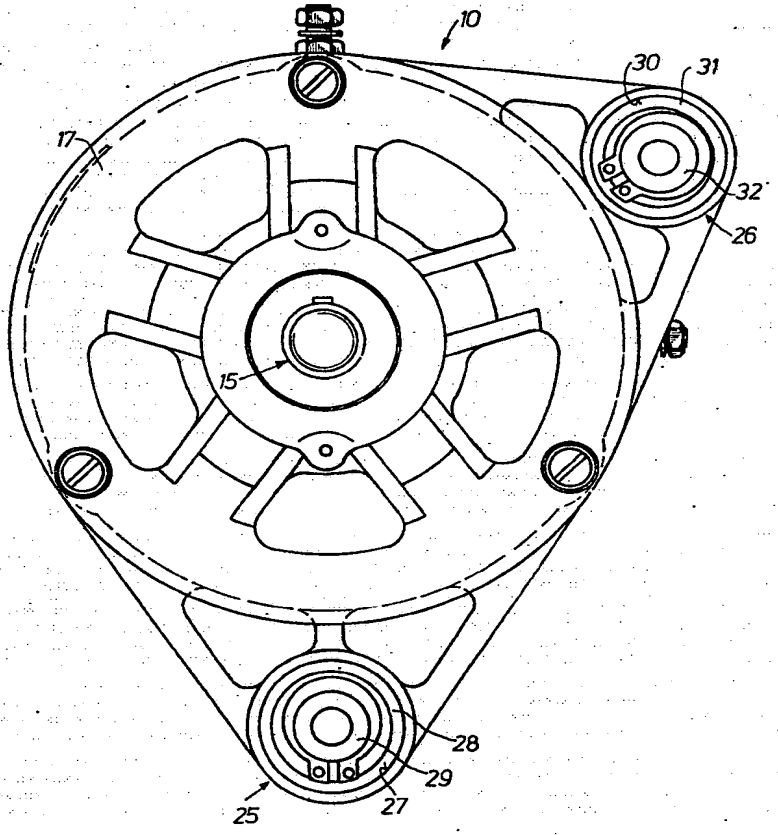

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Fig. 3

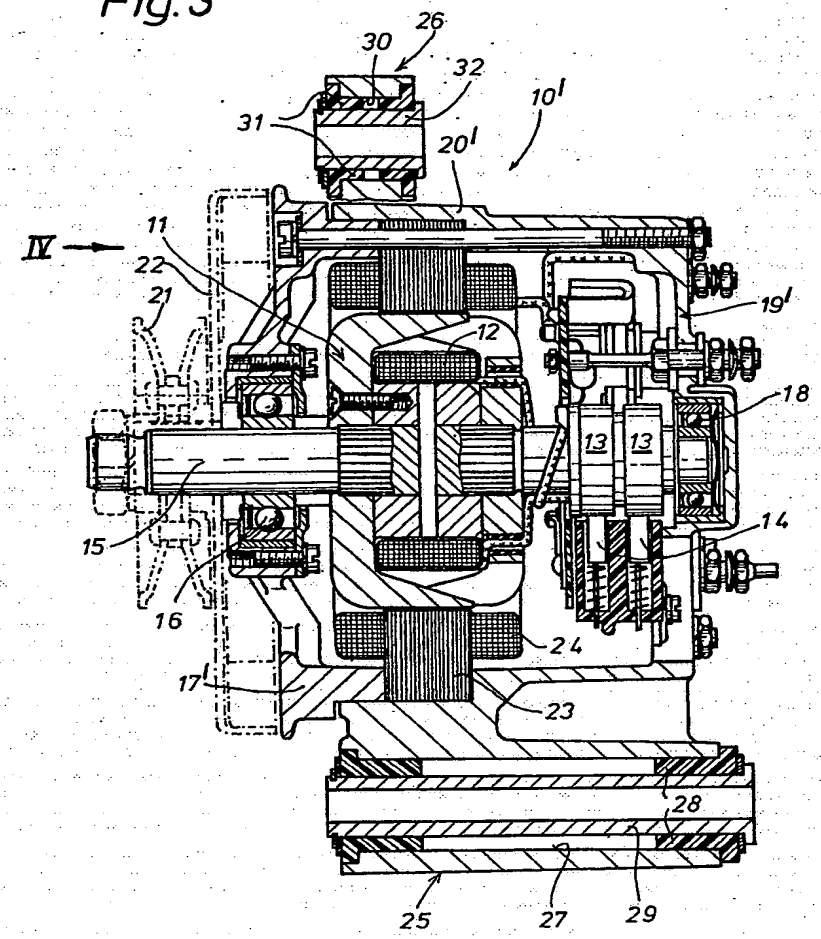

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Fig. 4